

Methods & Tools to Accomplish Distribution Resources Planning

CPUC DRP Workshop (R.14-08-013)

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Definitions (* designate relatively new terms)

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- EE – energy efficiency (proceeding)
- DG -- distributed generation (proceedings)
- *DMC/DMP – distribution marginal cost/price
- DR – demand response (proceeding)
- *DRP – distribution resource plan
- GHG – green-house-gas (AB 32 proceeding)
- *IDSRP – integrated demand-side resource program (proceeding)
- LMP – locational marginal cost (wholesale electric price)
- LTPP – long-term procurement plan (proceeding)
- SPM – California standard practice manual for cost-effectiveness
- ST – storage (proceeding)
- ZNE – zero-net-energy (buildings)

Overview of Presentation

- I. Policy context & methods: < GHG, > EE, DR, DG, ZNE, DRP, IDSRP (integrate) => 100% clean energy
- II. Paths to innovate @ market speed
- III. Methodology consistent w/ SPM Tests
- IV. Criteria to define optimal locations/options
 - SPM NPVs reveal Distribution Marginal Costs
 - Investments use DMCs, then use DMPs
- V. DRP & plug-n-play -- 5 years/end-game?

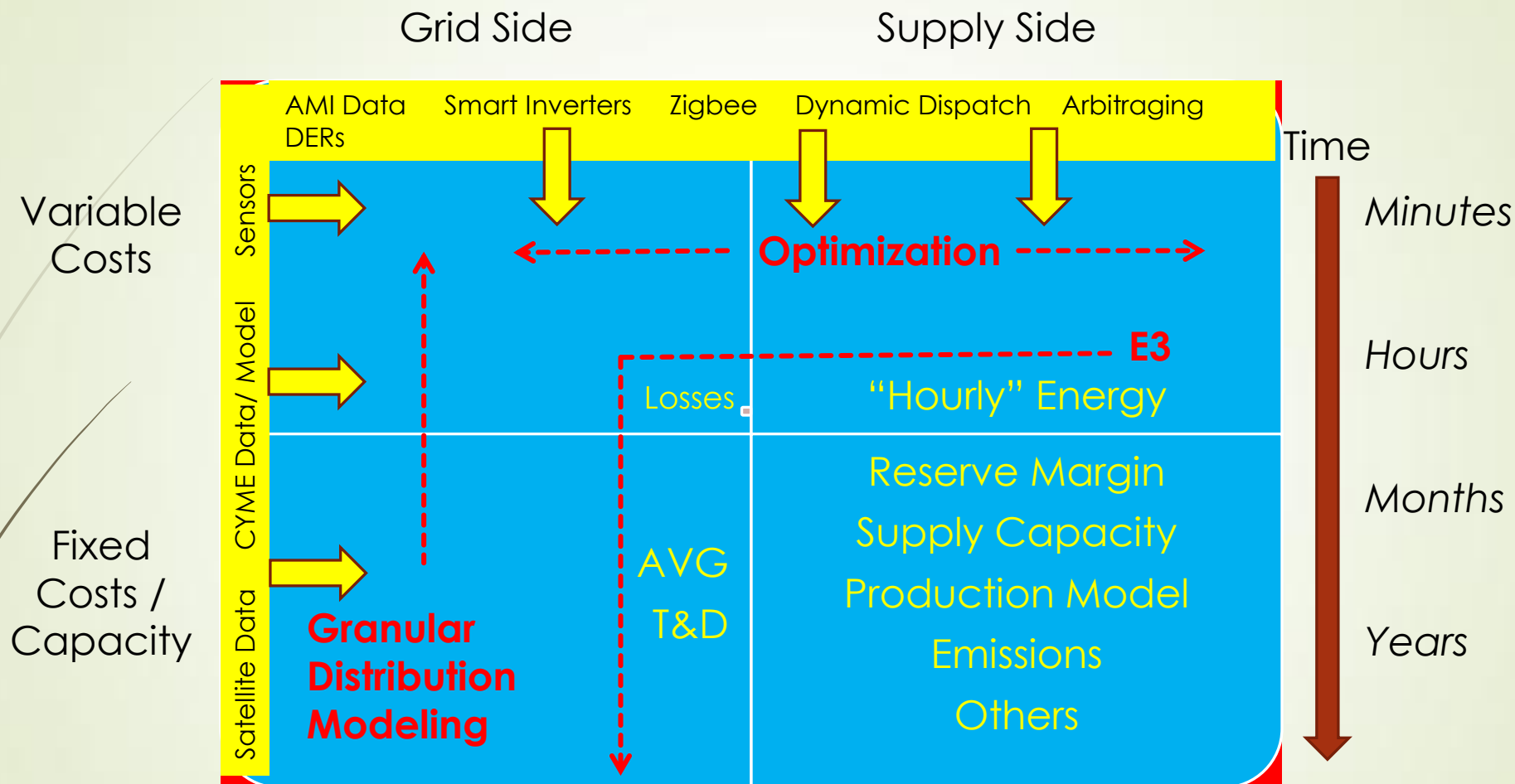
I. California Policy Context & Methods

- Integrate & Optimize Existing Silos -- DER, EE, DR, DG, ST, LTPP, IDSRP
- Focus on AB32, Loading-Order, IDSRP/ZNE
- Transform CA Standard Practice Manual

But this proceeding is about planning...

- What is missing in DER valuation and decision making – what is needed?

Grid Edge Requires A More Granular Focus



Averaging under-estimates savings opportunities. Current cost-effectiveness does not address sub-hourly avoided costs, nor granular DMCs. But, approaches can be blended.

Missing Parts in DER Valuation and Decision Making – these Point to Specific Needs

- Paths to innovate @ market speed?
 - Progress with 3rd party providers, but spotty
- Planning @ locations with granularity?
 - Full use of customer (interval), grid & planning data
 - Power flow analysis down to circuit levels
 - Multi-dimensional geo-spatial load forecasts
 - Integrated assessment of volt/VAR needs
- Integration of the silos & resource providers?
- Optimization of DER + the grid?

Objectives With New Tools

Key purpose: integrate DER @ optimal locations

- Framework to define DER investments
- Avoid IOU capital/variable costs
- Integrate grid services, volt/VAR management, reliability, situational awareness
- Optimization analysis to maximize benefits

=> Cost-effective solutions to achieve state goals

Integrate & optimize DER to maximize customer value w/ “packages” @ locations

II. Create Paths to Innovate @ Market Speed

- Who decides what DERs/where installed?
 - EE & DR, CPUC (customer)
 - DG, largely 3Ps (customer)
 - Power electronics, utilities, 3Ps
- Competitive RFPs use 3Ps (PRP, new...)
 - “All-source” approach, though few 3Ps do this
- Define optimal locations/resources and use 3Ps
- Define optimal price signals to let 3Ps play?

III. New Methodology Consistent with Old SPM Tests for Cost-effectiveness

- Standard Practice Manual (SPM) Tests
 - “Since 1983” -- the Total Resource Cost (TRC)
 1. “Participant Test” – customer targeting
 2. “Utility Test” -- grid (revenue) impacts @ locations
 3. “All Ratepayers” (TRC) – define the covariance, hedge/insurance/option value
 4. “Societal Test” to optimize for the utility and all ratepayers

All four of these steps use greater granularity

Four (SPM) Steps to Maximize Value

Achieve resource integration & optimization

- Customer targeting/engagement with the use of new data and locational knowledge
- Utility distribution and DER integration with locational granularity
- Capture interactive (covariance) benefits
- Optimize to choreograph loads and resources for maximum benefit

IV. Criteria to Define Optimal Locations and Best-Practice Methods

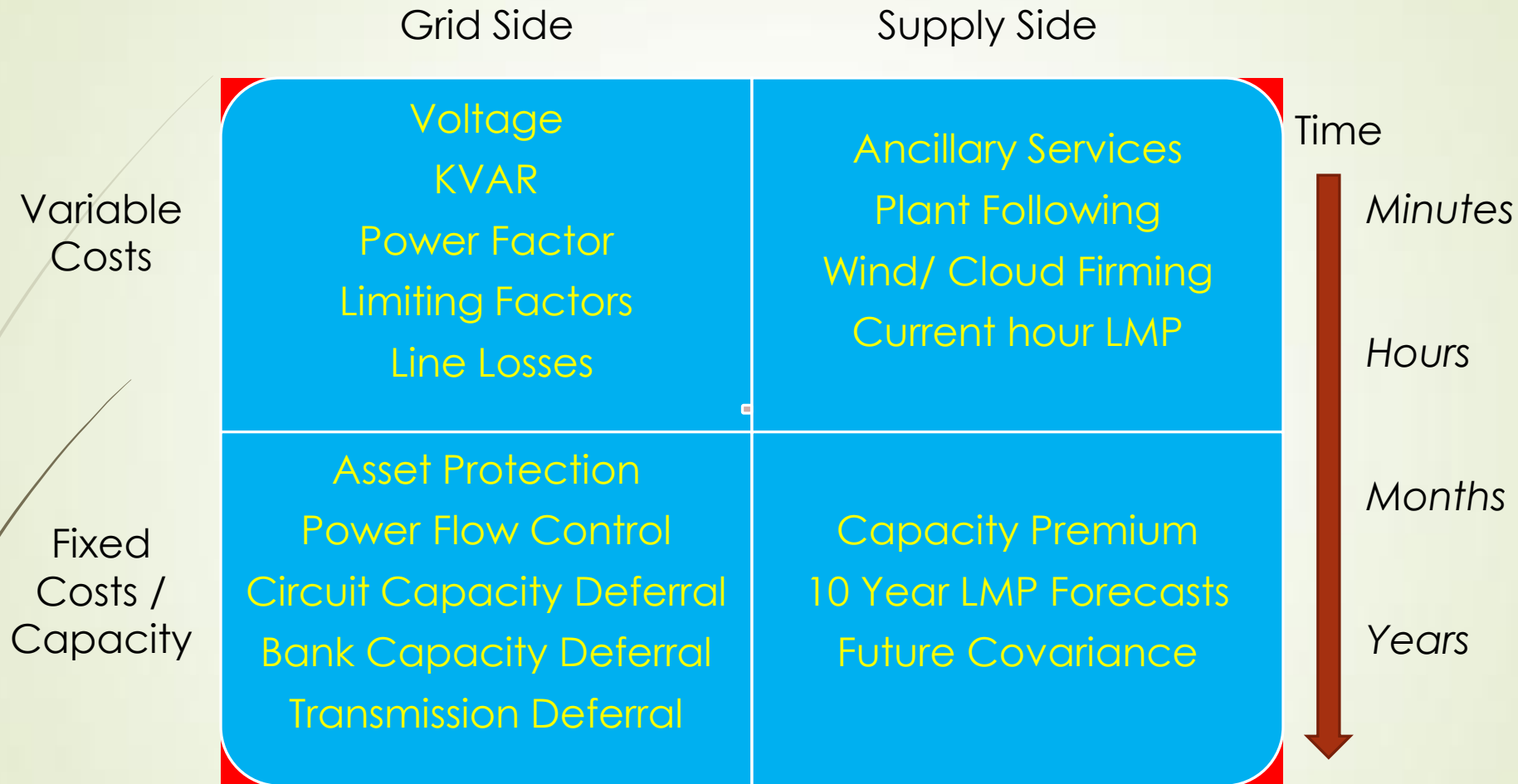
- SPM uses net-present-values (NPVs)
- NPVs => Distribution Marginal Costs (DMCs) to target resource locations
 - Combine grid, load, and resource effects
 - Investment options can use DMCs
- Price options using Distribution Marginal Prices (shorter-term, dynamic)
- Chart gaps from planning stages to pricing...

Inputs to DRP Valuation

Old Assumptions	Granularity	New Assumptions	Granularity
T&D Energy value	System average kWh	Distribution MC energy/volt/VAR	Bank to customer kWh, KVA/KVar
T&D Capacity value	System average kWh	Distribution MC capacity/volt/VAR	Bank to customer kW, KVA/KVar
Measure Load Shapes	Statewide average	Customer measure impact	Technology/customer level
Gen. Avoided Energy Cost	Statewide average kWh	Real energy price w/regression	Nodal price
Gen. Avoided Capacity Cost	Statewide average kW	Capacity price w/regression	Nodal price

Four Types of DMCs to Plan, DMPs to Price

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Some resources qualify for multiple quadrants. Ramping for example can be Grid or Supply Side and can be used quickly (minutes or less), but installed as capacity.

V. DRP & Plug-n-Play -- 5 year End-Game?

- DERs/grid-edge, integrated & optimized
- Like ISO/RTO, “open-access” GRIDCO that plans & invests to maintain standards and “hosting”
- 3Ps provide integrated (EE, DR, DG, ST +...) services – innovate @ market speed
- Planning & pricing proceed apace based on DMCs/DMPs and customer choice
- Gaps in planning & pricing become evident...

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